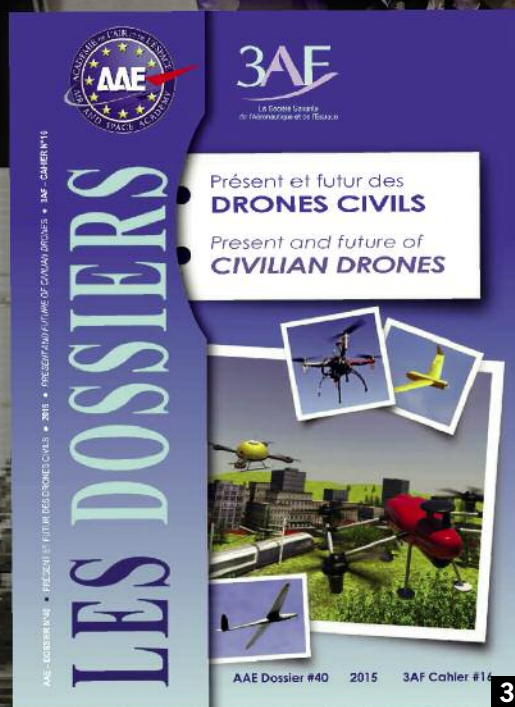




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AMONG THE SUBJECTS DEALT WITH:

- ON 20-23 OCTOBER 2015 TOOK PLACE IN LONDON THE EUROPEAN COMMISSION FLAGSHIP EVENT: AERODAYS 2015 1 2
- PRESENT AND FUTURE OF CIVILIAN DRONES 3
- ANTI-BALLISTIC MISSILE LAUNCH OF SAMP/T IN 2013 COORDINATED WITH NATO INTERNATIONALLY RECOGNISED 4 5

WHAT IS THE CEAS ?

The Council of European Aerospace Societies (CEAS) is an International Non-Profit Association, with the aim to develop a framework within which the major Aerospace Societies in Europe can work together.

It presently comprises thirteen Full Member Societies: 3AF (France), AIAE (Spain), AIDAA (Italy), AAAR (Romania), CzAeS (Czech republic), DGLR (Germany), FTF (Sweden), HAES (Greece), NVvL (Netherlands), PSAA (Poland), RAeS (United Kingdom), SVFW (Switzerland), TsAGI (Russia); and four Corporate Members: ESA, EUROAVIA, LAETA (Portugal) and VKI (Belgium).

Following its establishment as a legal entity conferred under Belgium Law, this association began its operations on January 1st, 2007.

Its basic mission is to add value at a European level to the wide range of services provided by the constituent Member Societies, allowing for greater dialogue between the latter and the European institutions, governments, aerospace and defence industries and academia.

The CEAS is governed by a Board of Trustees, with representatives of each of the Member Societies.

Its Head Office is located in Belgium:

c/o DLR – Rue du Trône 98 – 1050 Brussels.

www.ceas.org

WHAT DOES CEAS OFFER YOU ?

KNOWLEDGE TRANSFER:

- A well-found structure for Technical Committees

HIGH-LEVEL EUROPEAN CONFERENCES:

- Technical pan-European events dealing with specific disciplines and the broader technical aspects
- The CEAS European Air and Space Conferences: every two years, a Technical oriented Conference, and alternating every two years also, a Public Policy & Strategy oriented Conference

PUBLICATIONS:

- Position/Discussion papers on key issues
- CEAS Aeronautical Journal
- CEAS Space Journal
- CEAS Quarterly Bulletin
- Aerospace Events Calendar – www.aerospace-events.eu

RELATIONSHIPS AT A EUROPEAN LEVEL:

- European Commission
- European Parliament
- ASD (AeroSpace and Defence Industries Association of Europe), EASA (European Aviation Safety Agency), EDA (European Defence Agency), ESA (European Space Agency), EUROCONTROL
- Other European organisations

EUROPEAN PROFESSIONAL RECOGNITION:

- Directory of European Professionals

HONOURS AND AWARDS:

- Annual CEAS Gold Medal to recognize outstanding achievement
- Medals in technical areas to recognize achievement

YOUNG PROFESSIONAL AEROSPACE FORUM

SPONSORING

THE CEAS MANAGEMENT BOARD

IT IS STRUCTURED AS FOLLOWS:

- General Functions: President, Director General, Finance, External Relations & Publications, Awards and Membership.
- Two Technical Branches:
 - Aeronautics Branch
 - Space Branch

Each of these two Branches, composed of specialized Technical Committees, is placed under the authority of a dedicated Chairman.

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EDITORIAL

ABOUT THE LIFE OF THE CEAS



Jean-Pierre Sanfourche
Editor-in-Chief,
CEAS Quarterly Bulletin

As it clearly appears in the successive quarterly bulletins, the CEAS is without respite developing initiatives with the ambition to achieve a better and better co-operation between its members – full, associate and corporate – and also to develop more and more fruitful relations with different societies via appropriate Memorandums of Understanding.

We are pleased to announce here the official admission of the Czech Aerospace Society as Full Member, becoming so the thirteenth one. May this society be ensured that we will make all our best to encourage and facilitate the realisation of its CEAS related proposed actions.

As regards the societies linked with us via a Memorandum of Understanding, there is a new one since the end of 2015: this is the European Association of Research Establishments (EREA), which represents quite an important milestone on the road of our development, why? Because among our objectives, is the keen intention to play a major role in the improvement of European Aerospace Science and Technology Communication. As a matter of fact, this is the quality of its publications which makes the notoriety of a science & technology association.

"The free, unhampered exchange of ideas and scientific conclusions is necessary for the sound development of science, as it is in all spheres of cultural life." (Albert Einstein, 1952)

Two Journals were created in 2011 under the umbrella of CEAS in order to provide an appropriate platform for excellent publications submitted by scientists and engineers: on the one hand the CEAS Aeronautical Journal and on the other hand the CEAS Space Journal, both being peer-reviewed and edited by Springer. Even if the quality of the issues edited so far can be considered as very good, it appears mandatory to further strengthen our efforts to get high standard papers from research institutions, industry and academia if we wish to see these publications accede to the rank of 'Reference Science and Technology Journals'.

Thanks to the above mentioned MOU, it is sure that the EREA, which gathers Europe's fourteen most outstanding research establishments active in aviation and air transport, will constitute for us an exceptional layer of high standard articles.

Besides, the links being presently reinforced between CEAS and a number of other European aerospace science oriented associations within the framework of the E-CAero 2 project currently managed by the European Commission, should allow also the generation of a high standard papers in the CEAS Journals.

To allow the access of the CEAS Journals to the rank of 'Reference Publications' would constitute quite a fundamental achievement: this is difficult, but possible!

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CEAS ANNUAL REPORT FOR 2015

By Fred Abbink, CEAS President 2015



Fred Abbink, CEAS President

In 2015 CEAS has worked on the following main subjects;

- CEAS Strategy 2015-2020
- Membership and European cooperation
- Knowledge dissemination
- CEAS Journals and Bulletin
- European links
- International relationships
- Education and young people

CEAS Strategy

In September 2015 it was 10 years since the CEAS Statutes and Bylaws were signed in Hamburg.

It felt like a good idea to prepare the CEAS strategy for 2015-2020 and discuss it with the CEAS Presidents at the President's Lunch on the CEAS Conference on September 7, 2015.

Important the points in the CEAS strategy are:

- to increase the number of CEAS Members and Corporate Members and strengthen the links with for CEAS important European organisations through MoUs;
- to strengthen the relation with the European organisations, as EU Horizon 2020, JU Clean Sky, JU SESAR, EREA, EDA, EASA, etc.
- to strengthen the links with the European aerospace universities and student/young professionals;
- to promote the CEAS Journals as important vehicles for the peer-reviewed publication of European science and technology aerospace articles.

Membership and European cooperation

- On March 17, I was invited to give a keynote speech at the Clean Sky Forum in Brussels. The title of the presentation was "European Aerospace Competitiveness: Successes and Challenges". In the presentation I could also present CEAS as an example of excellent cooperation between 12 European member Societies with in total 34000 individual members.
- In September 2015 at the CEAS 2015 Air and Space Conference the Memorandum of Understanding between CEAS and the association of European Research Establishments in Aeronautics (EREA) was signed by the EREA President Josef Kaspar and the CEAS President.
- In November 2015 EASA became a Corporate Member of CEAS. This increased the number of Corporate Members to 5 (ESA, VKI, EUROAVIA, LAETA and EASA)

– In December 2015 the Czech Aerospace Society became full member of CEAS. With this Czech membership the number of full members increased to 13.

– At the December Board of Trustees meeting a new MoU with The European Aeronautics Science Network Association EASN was discussed.

Knowledge dissemination

The CEAS 2015 biennial conference, with the theme "Challenges of European Aerospace", was held in Delft, The Netherlands on 7-11 September 2015:

- 530 delegates (90% European) attended the event on one or more days from 40 nations all over the world;
- 240 speakers presented (16 keynote Plenaries, 140 scientific papers, 111 of which dealt with aeronautics and 29 with space related subjects);
- 3 EU project workshops (AFLonext, IN2SAI, PulCher) and European Strategic Wind tunnels Improved Research Potential ESWIRP achievements presented;
- 12th European Workshop on Aircraft Design Education EWADE meeting held;
- 14 exhibitors participated with their booths;
- 200 delegates attended the dinner at the paddle steamer "De Majesteit" while cruising the impressive Rotterdam harbors. During the dinner, the CEAS Gold Award 2015 was presented to Joachim Szodrich (DLR, Germany) for his lifelong efforts to increase European cooperation in the field of European cooperation in aerospace.

The papers of the CEAS 2015 Congress will be openly made available through the CEAS Website.

The CEAS Technical Committees were active in preparing and organizing a great number of specialist conferences:

- CEAS Specialist Conferences on Aeronautic Subjects were:
 - The 3rd CEAS EuroGCN Conference was held in Toulouse from April 13-15. The conference was co-organised by ONERA, ISAE-SUPAERO and ENAC;
 - The 21th AIAA/CEAS Aeroacoustics Conference was held in Dallas (USA) on June 15;
 - The 16th International Structural Aeroelasticity and Dynamics Forum IFASD 2015 was held in St Petersburg, Russia, from June 28 to July 2. The Forum was organised by our CEAS Member Society TsAGI ;
 - The 5th International Air Transport and Operations Symposium in Delft, The Netherlands, on 20-23 July. Organised by the CEAS Aeronautics Branch Technical Committee "Integrated Air Transport Operations";
 - The 41th European Rotorcraft Forum (ERF) was held from 1-4 September in Munich, Germany;
 - The 12th European Workshop on Aircraft Design Education (EWADE 2015) was held in Delft on Sept 9-11 in Delft, The Netherlands;

- The 19th CEAS Aeroacoustics workshop ‘Broadband Noise of Rotors and Airframe’ was held on September 23-25 in La Rochelle, France.

CEAS Specialist Conferences on Space Subjects, organised or co-organised by our CEAS Corporate Member ESA, were:

- 8th European Symposium on Aerothermodynamics for Space Vehicles Symposium was held on 2-6 March in Lisbon, Portugal;
- 13th Symposium on Advanced Space Technologies in Robotics and Automation, 11-13 May 2015, ESA/ESTEC, Noordwijk, The Netherlands;
- 16th European Space Mechanism and Tribology Symposium (ESMATS) 2015 was held from 23-25 September in Bilbao, Spain;
- 12th International Planetary Probe Workshop, 15-19 June 2015, Cologne, Germany
- 29th European Space Thermal analysis Workshop, 3-4 November 2015, ESA/ESTEC, Noordwijk, The Netherlands;
- 29th European Space Thermal analysis Workshop, 3-4 November 2015, ESA/ESTEC, Noordwijk, The Netherlands;
- 2nd Workshop on Spacecraft Shock Environment and Verification, 19-20 November 2015, ESA/ESTEC, Noordwijk, The Netherlands;
- Workshop on Innovative Technologies for Space Optics Active Optics, Free Forms, Stray-light Modelling and Test, 23-26 November, ESA/ESTEC, Noordwijk, The Netherlands.

CEAS Journals and Bulletin

The CEAS Aeronautical and Space Journals play an important role in allowing authors in the nations of the CEAS Member Societies to publish their papers in a peer-reviewed journal. Of the CEAS Aeronautical Journal 4 issues with 45 papers were published and of the CEAS Space Journal 4 issues with in total 34 papers. This was made possible by the great support and leadership of Christophe Hermans (CEAS Branch Chief Aeronautics) and Constantinos Stavriniadis (CEAS Branch Chief Space) and their Technical Committee chairs and supporting staff.

And of the CEAS Bulletin 4 quarterly Issues were published. Jean-Pierre Sanfourche (Editor of the CEAS Bulletin) played an essential role in the realization of this important “Face of CEAS”. The CEAS Bulletin amongst others contains interesting articles on actual aerospace subjects and a listing of all important upcoming aerospace events and conferences. The CEAS Bulletins and Aeronautical and Space Journals are excellent ways to increase the visibility of CEAS. In the EREA Board meeting in December 2014 several EREA Board members expressed their views that the CEAS Journals should be used to publish the papers of their Research Establishments.

European Links

- The CEAS MoU partner Académie de l’Air et de l’Espace (AAE) was part of the CEAS 2015 Programme Committee and support the programme with presentations/papers.

- CEAS, together with CIMNE, ERCOFTAC, EUROMECH and EUROTURBO have worked on the EU Project European Collaborative Dissemination of Aeronautical Research and Applications (E-CAERO 2).

I am very grateful to Pierre Bescond, (CEAS Vice President for External Relations and Publications), Christophe Hermans (CEAS Branch Chief Aeronautics) and Mercedes Oliver-Herrero (CEAS Director General) for all their work to support E-CAERO 2.

- On 20-23 October the EU Aerodays – the 7th European Aeronautics Days – ‘Aviation in Europe – Innovation for Growth’ were held in London. The CEAS Vice President External Relations, Pierre Bescond was invited to deliver the CEAS presentation. Furthermore CEAS had a booth in the exhibition area and several CEAS Board members participated in these EU Aerodays.

International Relationships

On 31 August-3 September, the ICAS Programme Committee Workshop was held in Krakow, Poland, with a very interesting workshop on complex systems. The ICAS Programme Committee selected the abstracts for the ICAS Congress 2016 in Daejeon, Korea. A number of CEAS Board members participated in this ICAS Programme Committee meeting.

Furthermore I participated in the AIAA International Activities Committee meeting I was able to discuss the ICAS-CEAS cooperation in the context of the ICAS-CEAS MoU.

Education and Young People

- CEAS supports the links with the aerospace students through its relation with EUROAVIA. The EUROAVIA President Pia Becker was present at the meetings of the CEAS Board of Trustees in 2015. On 22 September in Leuven, Belgium I had the opportunity to present “CEAS in Brief” at the EUROAVIA Annual Meeting of the EUROAVIA Congress;
- The CEAS 2015 Conference at the Aula Congress Centre of the Technical University Delft enable 140 aerospace students of the TU-Delft and of the Aerospace Division of the InHolland College to easily attend the keynote lectures in the large auditorium;
- CEAS is working on means to make the papers presented on its biennial conferences, as well as of its Specialist Conferences open available to students, young professionals and to its individual members. The Presidents of the CEAS Member Societies strongly support this initiative. The E-CAERO 2 EU project will also initiate activities towards this objective, and incorporating the aerospace related papers from other more broad conferences as ERCOFTAC, EUROMECH and EUROTURBO.

General

- In 2015 we have had one General Assembly meetings (Brussels-December 9) and four Board of Trustees meetings (Bologna - February 28, Warsaw-June 5, Delft-September 8 and Brussels-December 9).
- At the Board of Trustees meeting in Delft the CEAS

Member Society AAAR was selected to organize the 6th CEAS Air and Space Conference 2017 in Bucharest, Romania; In the context of the E-CAero 2 project Christophe Hermans and I visited AAAR and the proposed venue for the 6th CEAS Conference together with representatives of EUCASS on October 26-27 to investigate the possibility to have a joint CEAS-Eucass Air and Space Conference in 2017 in Bucharest.

- Under the leadership of Kaj Lundahl, CEAS Vice President Awards and Membership the selection of the recipient of the CEAS Gold Medal 2016 was prepared and executed.

- CEAS has started using the new CEAS Website.

I want to sincerely thank all the CEAS Trustees for their support in 2015. A special thank goes to Mercedes Oliver-Herrero (and her employer Airbus) for her outstanding work as CEAS General Director and for her great support she has given me.

Finally to my great sorrow, CEAS was confronted with the sudden death of prof. Franco Persiani, former President of the AIDAA and CEAS Trustee for many years.

And let's also recall that Franco Persiani, from Bologna University and AIDAA President, had been inducted Honorary Member of the Greek Society (HAES) by its President Ioannis Vakrados at a ceremony and reception on the eve of our BoT meeting in Athens, 14 June 2012.

In 2011 he successfully organised the 3rd CEAS Air and Space Conference in Venice, and recently, in February 2015, he still welcomed us in Bologna for our Board of Trustees meeting.

Franco Persiani was a great supporter of European cooperation in aerospace, a strong supporter of CEAS and a very cooperative and pleasant person to work with.

We are grateful for what he did for CEAS and will dearly miss him.



MEMORANDUM OF UNDERSTANDING

Between The Association of European Research Establishments in Aeronautics

Anthony Fokkerweg 2 – 1059 CM Amsterdam – The Netherlands (hereinafter called EREA)

and The Council of European Aerospace Societies

C/o Centre Aérospatial Allemand Bureau Bruxelles - 98 Rue du Trône 1050 Bruxelles Belgium (hereinafter called CEAS)

1.0 BACKGROUND

The Statutes and Bylaws of the Council of European Aerospace Societies (CEAS) were signed in Hamburg on Sept 16, 2005. CEAS, a not-for-profit umbrella organization, aims to develop a framework within which the major aerospace societies in Europe can work more closely together.

Following its establishment as a legal entity conferred under Belgium Law and the approval of the Statutes at the General Assembly, the new organization has begun its operations on 1 January 2007 and is currently headquartered at the Brussels offices of the DLR.

At present CEAS has 12 European Member Societies representing over 34.000 individual members of these 12 societies.

The CEAS mission is to add value at a European level to the wide range of services provided by the constituent member societies, allowing for greater dialogue between the latter and the European institutions, industry, government and academia. Specific linkages are sought with the EC (European Commission), ASD (Aerospace and Defense industry association), ACARE (Advisory Committee for Aeronautics Research in Europe), EASA (European Aviation Safety Agency), EDA (European Defense Agency) and ESA (European Space Agency). In addition, the new Council is focusing on education & training and how best to encourage high-talented students and engineers to choose a career in aeronautics or space.

Reporting to the Council are two Branches, one focused on Aeronautics and the other on Space. By engaging professionals in a number of Technical Committees in each sector, the Branches provide a European focal point. Each Branch publishes a peer-reviewed journal providing in-depth reviews of new developments in all areas of aeronautics and space.

The Technical Committees of the Aeronautics Branch organize Specialists Conferences on subjects as Aero-acoustics, Rotorcraft, Aero-elasticity, Guidance Navigation and Control, Aircraft Design and Integrated Air Transport Operations. The Technical Committees of the Space Branch organize Specialists Conferences on subjects as Space Power, Space Propulsion, Aerospace Mechanisms, Thermal Analysis, tribology and aerothermodynamics.

Bi-annual Conferences are planned to provide a forum for discussion of public policy, science and technology topics. The conference organization rotates between the national member societies. Bi-annual Conferences have been held in Berlin (2007), Manchester (2009), Venice (2011), Linköping (2013) and Delft (2015)

EREA is the association of European Research Establishments in Aeronautics. It is a non-profit organization which gathers Europe's eleven most outstanding research centers active in the field of aviation and air transport. These organizations gathered in EREA with the goals to:

- promote and represent joint interests;
- intensify the co-operation in the field of civil, military and space-related aviation research;
- improve and intensify the co-operation with third parties in the field of aviation, and to facilitate an integrated management of joint activities, thereby contributing to Europe's role as a global player in aviation.

EREA was founded in May 1999 and is responding to this European need by:

- Scientific and technical support to industrial projects;
- Cooperating with authorities and industry to define and implement a long term research policy encompassing both commercial and technological dimensions;
- Providing objective, neutral and impartial expertise to EU, national authorities, industry and other bodies.

The EREA fields of activity are relating to aviation in the fields of Basic Research, Applied Research and Support to Development:

- Aerodynamics
- Materials & Structures
- Propulsion
- Flight mechanics
- Acoustics
- Avionics
- Security
- Ground testing
- Flight testing, Simulation
- Human factors
- Environment measuring
- Safety
- Air & airport traffic management
- Aircraft operation

2.0 PURPOSE

EREA and CEAS have agreed to establish this Memorandum of Understanding (MOU) to better serve the common interests and welfare of their respective memberships.

3.0 AIMS

Support knowledge exchange between subject matter experts (at European level).

Encourage scientists to publish the outcome of their research in the CEAS Aeronautical and Space Journals as significant European peer-reviewed aerospace journals.

Strengthening of education and training of students and young engineers in the field of aerospace.

Support to European Institutions (EC, ASD, ACARE, EASA, EDA) in decision making, stressing importance of future European aviation research.

Increase global visibility of European aviation competences (sciences).

Provide more recognition/awareness for aviation sciences as a major field of research.

Enhance scientific and technical quality of events / conferences by aggregating expertise (speakers, program committee membership).

Increased visibility of European aviation events and publications.

Enhance the impact and accessibility of publications relevant to European aviation and aerospace community by implementing a policy in the publication domain with focus on open access.

Facilitate the access of the young researchers to the state-of-the-art information and networking opportunities.

4.0 IMPLEMENTATION

CEAS and EREA representatives will meet once per year to exchange information about their planned and running activities. Every other year at the EREA Board meeting in Brussels in December or during a CEAS Trustee Meeting in Brussels in the midst of the year with the EREA Chairman or another EREA representative of the Board..

This MOU will become valid upon the approval of the appropriate governing bodies of both organizations and signed by authorized representatives thereof.

All formal correspondence between organizations will be directed to the President of CEAS, C/o Centre Aérospatial Allemand, Bureau de Bruxelles, 98 rue du Trône, 1050 Bruxelles, and to the President of EREA, C/o EREA, Anthony Fokkerweg 2, 1059 CM Amsterdam, The Netherlands

Amendments to this MOU may be made at any time, but must be mutually agreed in writing by both organizations.

Signed on 9 September 2015 in Delft, Netherlands,

F.J. Abbink
Chairman CEAS

J. Kaspar
Chairman EREA



IN MEMORIAM



Professor Franco Persiani passed away on 30 October 2015 after a prestigious career dedicated to the innovation in the aeronautical field.

He was full professor at the Department of Industrial Engineering, University of Bologna, located in Forlì, Italy. As the First Dean of the Aerospace Engineering Faculty, that he founded in 2002, he brought an outstanding contribution to the development of the aerospace research at local and national level.

He was past-President of the Italian Member Society AIDAA (Italian Association of Aeronautics and Astronautics), active member of the CEAS Trustee Board as Italian representative and member of the Program Committee of ICAS (International Council of the Aeronautical Sciences).

Professor Persiani was well respected for his scientific achievements, his forward-thinking approach and his ability in turning challenges into opportunities.

Those who lived and worked in close relation with him will keep the lasting memory and the prestigious heritage of a truly great, fair, warm human being.

*Sara Bagassi
Francesca Lucchi
Francesca De Crescenzo*

CONFERENCE

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Clean Sky

CEAS

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OUR 13TH FULL MEMBER: THE CZECH AEROSPACE SOCIETY

Czech Aerospace Society is an unincorporated association in the field of engineering, science, and technology with individual and corporate members sharing their professional and personal interests in aeronautics and astronautics. A main aim of the Czech Aerospace Society is dedicated above all to cater professional interests of its members in the field of aeronautics and astronautics and to provide a room for improving its members' awareness about a current technology in these fields. The Czech Aerospace Society is a founding member of the Czech Association of Scientific and Technical Societies (ČSVTS) and plays an active role in a joint work and activities of this Association by contributing to common professional science and technology policy. The Czech Aerospace Society organizes various professional events focusing on dissemination of new information and knowledge among its members as well as in broader professional public. The Czech Aerospace Society provides a professional and social forum for its members by organizing seminars and conferences intended for both public and/or professionals; it publishes professional and scientific information in the mass media and journals at home and abroad; it expresses its opinion on problems in the field of aviation technologies; it offers its professional services to state institutions and industry.

News

Czech manufacturer **AIRCRAFT INDUSTRIES** has developed a new upgraded version of its long-servicing aircraft L410 twin-turboprop. The first L-410NG, OK-NGA was unveiled at the company's facility in Kunovice on July 15th, 2015 and made its maiden flight on July 29th, 2015 (*figure 1*). The L-410NG is a 19-passenger aircraft equipped with advanced new avionics, powered by two 850 hp GE H85 engines and capable of 2 154 kg payload.

Source: <http://www.let.cz/>



Czech manufacturer **EVEKTOR** is an international company belonging among the leading development and manufacturing companies which are active in the aircraft industry of the Czech Republic. One of its under-development product, the SportStar EPOS+ (*figure 2*), represents a future sport aircraft concept driven by an electric motor, environmentally friendly with low maintenance and operation costs. The power unit is a compact and more efficient DC electric motor RE BB 90-5 with increased power to 100 hp, developed by the company Rotex Electric, which directly drives the three-blade composite propeller manufactured by VZLÚ Prague (*figure 3*). Engine performance is controlled by an electronic control unit, developed by MGM COMPRO, which ensures optimal use of the energy stored in the battery containers. The aircraft can be equipped with two pairs of containers - each container includes 45 lithium polymer cells connected in series.

Source: <http://www.evektor.cz/en>

THE ROYAL AERONAUTICAL SOCIETY:

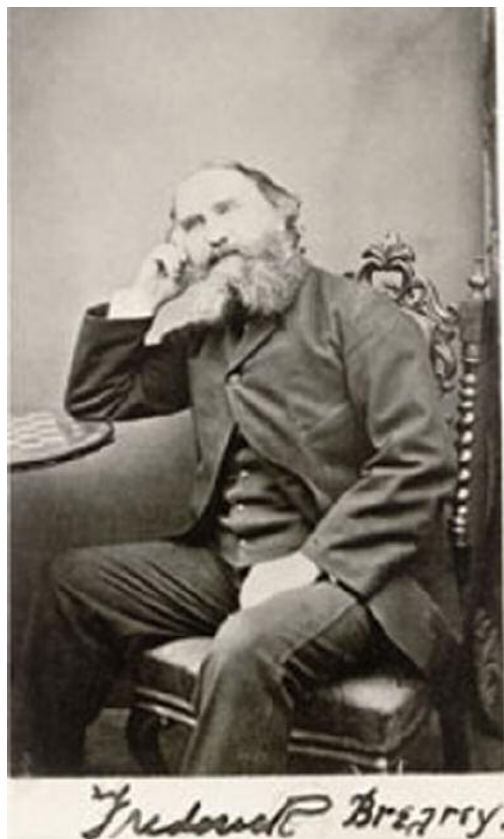
PART 1 - THE EARLY YEARS



Though balloons were commonplace in 1866 - the Society already was looking ahead to powered, heavier than air flight (RAeS/NAL)

150 years ago the Royal Aeronautical Society was formed as the 'Aeronautical Society of Great Britain'. A look back at how it was formed and its early history.

The Beginning

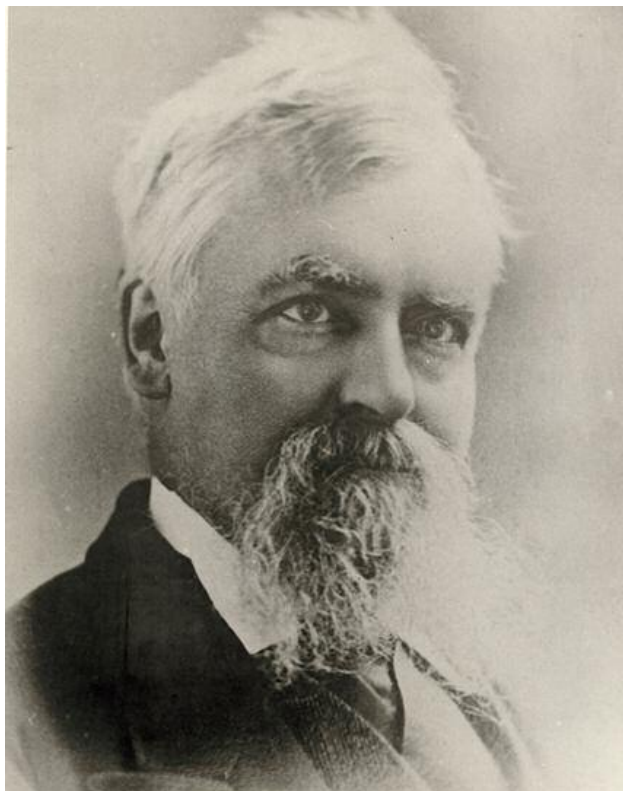


Fredrick W Brearey, Secretary of the Aeronautical Society of Great Britain, 1866-96, (RAeS/NAL)

"At a meeting held at Argyll Lodge, Campden Hill, on 12 January 1866, His Grace The Duke of Argyll presiding; also present Mr James Glaisher, Dr Hugh W. Diamond, Mr F.H. Wenham, Mr James Wm. Butler and Mr F.W. Brearey. Mr Glaisher read the following address: 'The first application of the Balloon as a means of ascending into the upper regions of the atmosphere has been almost within the recollection of men now living but with the exception of some of the early experimenters it has scarcely occupied the attention of scientific men, nor has the subject of aeronautics been properly recognised as a distinct branch of science ...'" and it was resolved "that it is desirable to form a Society for the purpose of increasing by experiments our knowledge of Aeronautics and for other purposes incidental thereto and that a Society be now formed under the title of the 'Aeronautical Society of Great Britain' to be supported by annual subscriptions and donations." So read the first pages of the first minute book of the Aeronautical Society of Great Britain. James Glaisher was a Fellow of the Royal Society and an astronomer and meteorologist of much distinction; Francis Wenham an engine designer with interests in scientific instruments, including microscopes, and Dr Hugh Diamond was a Doctor of Medicine and the Secretary of the London Photographic Society. These men, of diverse interests, founded the Society, nominating Council and Office-Bearers. The eighth Duke of Argyll was elected President, with the Duke of Sutherland and Lord Richard Grosvenor as Vice-Presidents. Glaisher became Treasurer and Brearey was appointed Honorary Secretary, a post which he held until his death in 1896. Rules were made quickly and presented for agreement and the objects of the Society were given as "for the advancement of Aerial Navigation and for Observations in Aerology connected therewith." The subscription was fixed at one guinea a year, which could be compounded for life for ten guineas. The first public meeting was held in the rooms of the Society of Arts (later Royal), Adelphi, on 27 June 1866, less than six months after the meeting at Argyll Lodge. Thus began an association with the Society of Arts which lasted for more than 70 years.

At this meeting a lecture was given by Wenham on 'Aerial locomotion and the laws by which heavy bodies impelled through air are sustained'. Wenham's lecture is now one of the aeronautical classics and was the beginning of the pattern of lecture activity which has survived to this day. From the beginning, the Society aimed at heavier-than-air flight; it was concerned not only with balloons and kites and bird flight, although these played a part in the discussions. At the end of the first year the Accounts were not difficult to render, for the income was £56 13s 0d, and the expenditure £46 18s 0d, a credit balance of just under £10. The total membership was 65. That year also saw the begin-

nings of the library of the Society, for the First Annual Report records that eight books had been presented, six of which were in French. In addition there were some 40 patent specifications.



Francis Herbert Wenham (1824-1908). Wenham's paper, presented at the first general meeting of the Society on 27 June 1866 discussed the principles of mechanical flight. (RAeS/NAL)

The First Aeronautical Exhibition



The first Aeronautical Exhibition, Crystal Palace, 1868 showing the Stringfellow Triplane model and other exhibits. No fewer than 77 exhibits were collected together including engines, lighter- and heavier- than air models, kites and plans of projected machines. (RAeS/NAL)

Although a combined exhibition with the French had previously been mooted Brearey, in August 1867, proposed that an "Exhibition of Machinery and Articles connected with Aeronautics should be held in 1868." Brearey's proposal was agreed by the Council, although the Society had been functioning for so short a time and had a balance of only 13s 6d. Members of the Council and others guaranteed the Society against loss. The catalogue of the Exhibition, which was held at the Crystal Palace, Sydenham, contained 77 entries. These were divided into seven classes – light engines and machinery; complete working aerial apparatus; models; working models; plans and illustrative drawings; articles connected with aeronautics; kites or other similar apparatus. In the last class a prize of £50 was offered by the Shipwrecked Mariners' Society for "the best form of kite for establishing a communication from a wreck on shore, or between two vessels at sea." The Duke of Sutherland, a Vice-President of the Society, offered a prize of £100 to the inventor of a machine which, being neither a kite nor a balloon, would "ascend with a man to the height of 120 feet." This prize was not won. Yet a third prize was offered "to the Exhibitor of the lightest engine in proportion to its power from whatever source the power may be derived." This prize was won by John Stringfellow, who exhibited a steam-driven triplane model.

Early Inventions and Theories

The use of aluminium became commonplace in aircraft construction but few realise that it was proposed as long ago as 1869 by D S Brown in a paper read to the Society. In the Annual Report of 1870 a systematic study of the connection between the pressure and the velocity of air was proposed; it was believed that such experiments would afford the only data in which a true science of aeronautics might be founded. The Report goes on "for this purpose an instrument has been designed by F H Wenham and approved by the Experimental Committee, which is intended to submit to the action of a fan not less than 30 inches in diameter, capable of delivering about 3,000 cubic feet of air per minute. A clear space of 15 feet or more in front of the fan will allow room for a square wooden trunk to guide the blast, ascertain its velocity, and insert the anemometer ..." This was the first wind tunnel in the world. The Experimental Committee consisted of James Glaisher and Charles Brooke, both Fellows of the Royal Society, and four engineers, F H Wenham, E W Young, D S Brown and La Feuvre. The tunnel was made at Penn's Engineering Works at Greenwich but no drawings or details have been unearthed, although it is known to have been ten feet long and a foot and a half square, and to have had four flat plates. It aroused considerable interest when it was exhibited to members in 1872. In 1871 Thomas Moy, a competent engineer and one of the enthusiastic pioneers, was elected a member of the Society; he was a confirmed believer in heavier-than-air flight and, with R E Shill, designed the Aerial Steamer. A model was shown to the Society in 1872 and in 1875 trials were made at the Crystal

Palace. They were described by Moy in a paper read before the Society in 1875 – they were not successful. In this same year Brearey was awarded the Gold Medal of the Société Française de Navigation Aérienne, a Society which has not survived. Seventy-six years later, one of Brearey's successors in the office of Secretary, Captain J L Pritchard, was also honoured by the French when, in 1951 at the fourth Blériot Lecture, he was presented with the Médaille Aeronautique. It was the first time this medal had been awarded to anyone in the UK. Although powered flight was the goal towards which many were striving, one member, Artingstall of Manchester, was advocating man-powered flight, a study which, much later, was given a tremendous fillip by the Society's Man-Powered Aircraft Group and the Kremer Prize. The years which followed were somewhat sterile in the heavier-than-air field and it was Moy, in 1881, who voiced the thoughts of many when he said that the scientific progress of the Society appeared to be very slow. The reports contained translations of papers by Alphonse Penaud and, in 1876, a reprinting of the famous paper 'On aerial navigation' by Sir George Cayley who was recognised by many both in this country and abroad as the "Father of Aeronautics". Just 20 years after the formation of the Society, a paper by Captain Griffiths was read in 1886 on 'Jet Propulsion for Aeronautical Purposes' (the words "jet propulsion" had been used by Wenham in a paper in 1867); five years before, Scoffern had written "it is now definitely known that as this speed – 1,100ft/sec – is approached the resistance increases very rapidly."



Members of the Aeronautical Society of Great Britain and other scientists and Baldwin's 5 July 1895, with Hiram Maxim's 1894 biplane. Hiram Maxim is in the middle of the three seated figures. (RAeS/NAL)

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AVIATION IN EUROPE - INNOVATION FOR GROWTH



AERODAYS2015 – the 7th European Aeronautics Days - took place on 20-23 October at the QEII Centre in London. This event was a full success with over 1100 attendees. It acted as a positive enabler for industry, governments, the European Commission, research institutions, academia and many others to come together to present strategic perspectives and achievements in Aviation Research & Innovation.

The three-day conference included technical sessions, R&T showcases and a host of keynote addresses from Aviation CEOs, European Commissioners, UK Ministers and Heads of key Agencies.

OPENING: AVIATION IN EUROPE – INNOVATING FOR GROWTH

WELCOME ADDRESSES were successively delivered by Marcus Bryson, CBE, Chairman, Aerospace Hub and Co-Chair, Aerospace Growth Partnership, Violeta Bulc, EU Commissioner for Transport, Monika Hohlmeier, Member of the European Parliament and Rudolf Strohmeier, DG Research & Innovation, European Commission.

KEYNOTE ADDRESSES were presented by three speakers: Warren East, Chief Executive of Rolls-Royce plc, Peter Hartman, Chairman ACARE and Executive & Vice-Chairman of Air France-KLM and Michael Ryan, Vice President and General Manager, Bombardier Belfast.

PLENARY SESSIONS:

PLENARY ONE: GREENING OF AVIATION

- Robert Goodwill MP, Parliamentary Undersecretary of State for Transport – UK's Aviation Strategy
- Ric Parker, Chairman of the Clean Sky Governing Board – Clean Sky
- Mike Sinnet, Vice President, Product Development, Boeing – Accelerating Innovation: Boeing's flying ecoDemonstrator

- Fayette Collier, NASA – US Environmentally Responsible Aviation Programme – NASA's Environmentally Responsible Aviation (ERA) Project: Exploring technological feasibility, benefits and risks

PLENARY TWO: CLEAR FOR TAKE-OFF

- Patrick Ky, Executive director of EASA – Achieving the Highest Standards of Safety in Aviation
- Gil Michieling, CEO, Thales Avionics – An Industrial Perspective on Enhancing Aviation Safety
- Lord Ahmad, UK Parliamentary Undersecretary for Transport – Aviation Security In An Increasingly Complex Environment

PLENARY THREE: SKILLS FOR SKIES

- Charles Champion, Executive Vice-President Engineering of Airbus – managing Skills and Fostering Innovation – Key Drivers for High Performance
- Rolf Henke, Member of the Executive Board of DLR – research Capabilities Skills – A New Approach for Harmonising Aviation Research Infrastructure
- Hester Bijl, Dean of the Aerospace Faculty of TU Delft – Training the Next Generation of a Highly Skilled Workforce

PLENARY FOUR: 15 YEARS OF ACARE: EUROPEAN AVIATION – A STRATEGIC APPROACH TO THE CHALLENGES

- Michel Wachenheim, ACARE Vice-Chairman – Increasing the Pace and Addressing New Challenges
- Frank Brenner, Director General of Eurocontrol – Changing Conditions Require New Approaches
- Josef Kaspar, Chairman of EREA and General Director VZLU – Building on Successful European Strategic Research – Looking forward to the Next 15 Years

PARALLEL SESSIONS

- **GREENING OF AVIATION:** Clean Sky, Alternative Fuels, Noise & vibrations, Design Tools & Production, Systems & Equipment, Maintenance, Disposal & Recycling, Mobility & Operations.

- **SEAMLESS AND EFFICIENT MOBILITY:** Mobility & Operations, SESAR.

- **SAFETY AND SECURITY:** Safety & Security, Systems & Equipment, Standards & Regulations.

- **COMPETITIVENESS OF AVIATION INDUSTRY:** Avionics, Design Tools & Production, Rotorcraft, Structures & Materials, Propulsion, Flight Physics.

- **RESEARCH AND INNOVATION POLICY:** International Co-operation, Research & Innovation Policy.



A drinks reception sponsored by Boeing took place at Lancaster House on 20 October evening.

Lancaster House, previously known as York House and Stanford House, is a mansion of neo-classical architecture style, located close to St James's Palace. It is managed by the Foreign and Commonwealth Office.

■ **SKILLS AND BREAKTHROUGH:** Outreach, Breakthrough Concepts.

CLOSING SESSION

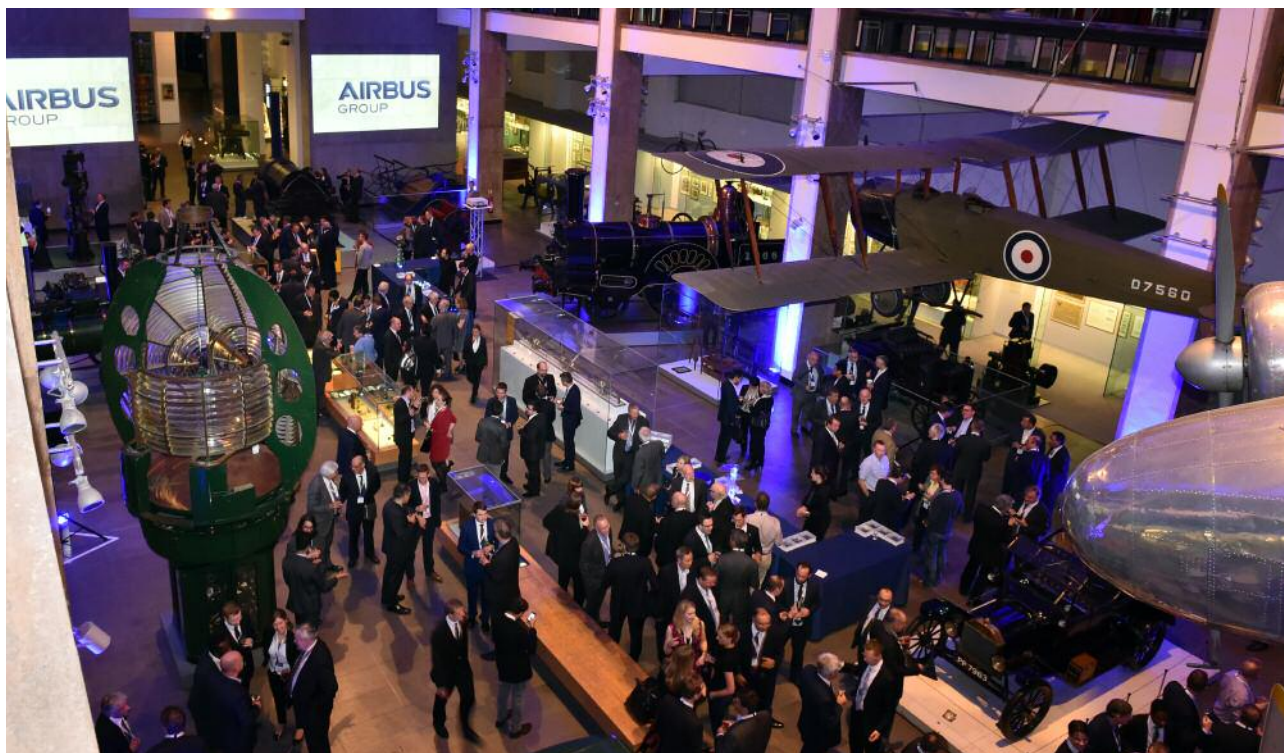
■ **KEYNOTE MESSAGES – AVIATION OF TOMORROW – CONNECTING THE WORLD:** Rt Hon. Anna Soubry MP – Minister for Small Business, Industry and Enterprise, Henrik Hololei, director General Mobility & Transport, European Commission and Chairman of the SESAR Administrative Board, Pierre Fabre – senior Vice-President R&T, SAFRAN Group – The View of Industry and the Technology Supply Chain.

■ **AVIATION KEYNOTES:** Florian Guillermet – Executive Director, SESAR JU – SESAR – Innovating for a High

Performing Single European Sky, Catherine M Lang – Director Europe, US federal Aviation Administration FAA – NextGen – Enhancing Efficiency and Safety in the US Airspace, Carlo Desideri, executive Director, European GNSS Agency GSA – Galileo – The European Global Satellite-based Navigation System, Rafael Schartzman, Regional Vice-President Europe, IATA – Future Air Travel Requires Innovation Focused on Passenger Needs.

■ CONFERENCE CLOSING MESSAGE

• Ian Pie, Secretary General of ASD – Aviation in Europe – Where do we stand and where we need to go ([See page 16](#)).



A networking dinner sponsored by Airbus Group took place at the Science Museum on 21 October evening.

Striving to be the best place in the world for people to enjoy science, the Science Museum's world – class collection forms an enduring record of scientific, technological and medical achievements from across the globe.

CLOSING SPEECH BY MR JAN PIE, ASD SECRETARY GENERAL

“It is my pleasure to be the last speaker at Aerodays 2015. The Aerodays 2015 Event has been a great success with hundreds of participants from Europe and beyond. I would like to congratulate the UK Aerospace and Defense Industries Association (ADS-UK) for the excellent organization of the event. As Secretary General of the Aerospace and Defense Industries Association of Europe (ASD), I am also happy to see that ASD has been a key partner for this successful event in support of ADS-UK. Indeed the European aerospace industry is a true European story. ASD represents the **Civil Aviation, Space, Security and Defence industries in Europe**. These industries, in turn, generate a **turnover of approximately 197 billion euro, invest over 20 billion euro in R&D**, employ some **778,000 people** and encompass over **3,000 companies** and 80,000 suppliers, many of which are SMEs. ASD's membership today is composed of 15 major European Aerospace and defence companies and 26 member associations in 19 countries: Civil Aviation, space, defence and security are crucial sectors for our continent. They strongly contribute to the attainment of many of Europe's key socio-economic goals, by ensuring sustainable mobility, by providing highly- skilled jobs, and by fostering Europe's knowledge economy through massive R&D investments. Thanks to their dynamism and innovative strength, our industries help Europe achieve and maintain technological excellence. **In the field of civil aeronautics, the European industries are also important exporters which benefit the EU economy in terms of jobs and economic development.**

The European aerospace industry is at the **foreground of technological innovation** in particular to meet ambitious environmental and energy efficiency targets (**the civil aerospace industry invests around 7 billion Euro per annum in R&D**). European industry players are main partners in flagship programmes including CleanSky and SESAR. These collective efforts all contribute towards meeting European and global environmental targets (e.g. emissions, noise and more environmental friendly materials):

- More efficient engines and bio-fuels
- More efficient aircraft (i.e. airframes, components, wings, etc..)
- More efficient rotorcraft including new concepts such as civil tilt-rotorcraft
- Improved Air Traffic Management technologies and procedures
- Green taxi technologies and improved airport operations
- More environmental friendly materials
- Longer Term Research on break-through technologies including electrical powered aircraft
- Thanks to those technological innovations, each new generation of aircraft reduces emissions by 15-20% whereas sustainable alternative fuels also have the potential to cut CO₂ emissions in the longer term.

Aviation safety in Europe is among the highest in the world and despite the increased terror threat, EU aviation secu-

urity levels are also among the highest in the world. We should therefore not forget the importance of innovations in the field of safety and security (including cyber security). Clearly in the field of aviation safety research, there should be a bigger role for the European Aviation Safety Agency (EASA) at least to define the priorities in line with the European Aviation Safety Plan (EASp) and through the involvement of some EASA experts where there is a benefit for the success rate of the project. For example, CleanSky will work on innovative aircraft certification procedures and obviously EASA should be involved so that the output can be implemented afterwards.

Indeed, it is essential to ensure that the output of Research can be implemented so that industry can benefit from new market developments. Safety is the European industry's top priority. Civil aircraft and engines need to be certified by EASA. EASA also needs the necessary expertise to certify new technologies such as next generation of aircraft and engines, new production methods (such as 3D printing) or new Air Traffic Management Technologies. There is therefore in particular **the need for EASA to be equipped with efficient working methods and sufficient financial means to carry out its certification tasks and to support industry projects at global level as it performs a crucial role in getting European aircraft products to the global market.** The upcoming European Aviation Package is the opportunity to fix this problem and to avoid that EU austerity measures lead to artificial cuts to EASA's budget which could delay industrial projects.

Finally some words about **Remotely Piloted Aircraft Systems (RPAS)** which are a promising market not only in defense but even more in civil applications. For example the surveillance of the Mediterranean Sea is today a hot topic and clearly larger civil RPAS with longer endurances could play a key role. The EU Commission did develop an RPAS Roadmap with ASD some years ago but it is now also **essential to put in place the measures to implement this roadmap.** In particular EASA needs resources to certify new large RPAS technologies and to put in place the necessary regulatory framework not only for the smaller RPAS but also for the larger RPAS. The regulatory framework should go hand in hand with a better coordination of RPAS related research at EU level. SESAR2020 should address the issue of insertion of RPAS into non-segregated airspace which will be a key enabler to develop the RPAS market.

In conclusion, in order for European industry to **continue to be a world class leader, continued investment in Research and Development (R&D) is essential.** In particular **European flagship programmes, such as CleanSky and SESAR should continue to receive priority for EU funding** and should not be confronted with additional bureaucratic constraints. Last but not least **the European Aviation Safety Agency (EASA) should be equipped with efficient working-methods and sufficient financial means to certify the new technologies so that they can be brought to the global market.** ”

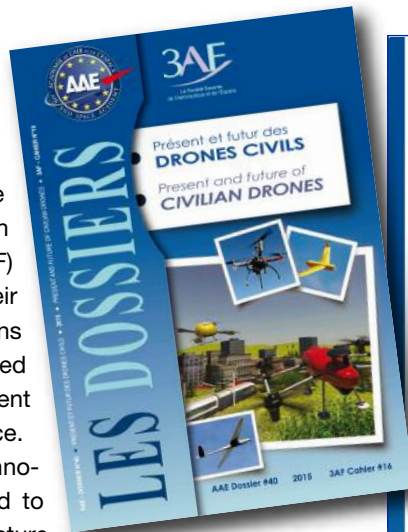
PRESENT AND FUTURE OF CIVILIAN DRONES

Following the conference organised by the Air and Space Academy (AAE) and French Aerospace Society (3AF) in Paris, 13-14 November 2014

Foreword

The Air and Space Academy (AAE) and the Association Aéronautique et Astronautique de France (French Aerospace Society, 3AF) endeavour to focus their attention and reflections on important issues linked to innovative development activities in air and space. Today, for instance, technological progress has led to the design and manufacture of unmanned aircraft. In the military field, recent decades have witnessed the development and operational use of Unmanned Air Systems (UAS) or Remotely Piloted Aircraft Systems (RPAS) for Intelligence/Surveillance/Reconnaissance missions and even more recently, for weapon delivery. In the more recent civilian drone sector, the explosion of ideas has been impressive, with an exponential rise in the number of drone operators and missions. We now have the technological capacity to produce small RPAS that are cheap to buy and to run. This is inspiring a services market, often proposed by innovative young companies. The mayors of our cities and towns are purchasing aerial views of their area. Farmers can monitor their crops and define appropriate treatments. Infrastructure owners such as EDF, SNCF and GRT Gaz are envisaging using drones in an increasingly intensive way to inspect tracks, lines and bridges that are often difficult to access. For several years, television has been a major user of drones and now filmmakers are also starting to use these innovative systems.

This proliferation of drone applications may represent a potential hazard to people and goods and makes their integration into an already congested airspace very complicated. So far, the number of accidents has been low and there have been few consequences, but the first serious accident is likely to hold back their expansion. Certification, regulation and safety authorities such as the French civil aviation authority DGAC, the Federal Aviation Administration (FAA) and the European Aviation Safety Agency (EASA) are of course aware of the criticality and urgency of this subject and are working on it. However, given the wide variety of vehicles and applications, it is tricky to imple-



L'Académie de l'air et de l'espace (AAE) et l'Association aéronautique et astronautique de France (3AF) s'efforcent de concentrer leur attention et leurs réflexions sur des sujets qui leur semblent importants en matière de développement innovant des activités dans l'air et dans l'espace.

C'est dans ce contexte que l'AAE et la 3AF ont organisé les 13 et 14 novembre 2014 dans le grand amphithéâtre de la DGAC à Paris le colloque "Présent et futur des drones civils".

Le présent dossier prend en compte non seulement les principaux enseignements du colloque, mais approfondit aussi la réflexion à partir de documents publiés entretemps par la Federal Aviation Administration (FAA) et la Commission européenne. Il contient notamment des recommandations sur la filière drones au niveau européen et français, sur leur conception et réalisation avec les besoins associés de développement et d'expérimentation, et sur la protection de la vie privée et la sûreté vis-à-vis d'actions illicites.

The Air and Space Academy (AAE) and the Association Aéronautique et Astronautique de France (French Aerospace Society, 3AF) endeavour to focus their attention and reflections on important issues linked to innovative development activities in air and space.

This is the context behind the conference organised by AAE and 3AF on "Present and future of civilian RPAS" on 13 and 14 November 2014 in the Paris DGAC auditorium.

This dossier not only takes into account the main lessons learned from the conference, but looks further, drawing on documents published in the meantime by the Federal Aviation Administration (FAA) and the European Commission. In particular, it contains recommendations on the European and French drone sectors, on drone design and realisation, including specific needs linked to development and experimentation, and on ensuring privacy and security with respect to illegal acts.

www.academie-air-espace.com
www.3af.fr

ment measures to ensure safety without impeding the creative momentum of young companies.

This is the context behind the conference organised by AAE and 3AF on "Present and future of civilian RPAS"¹ on 13 and 14 November 2014 in the Paris DGAC auditorium, with live broadcast to "École Nationale de l'Aviation Civile" (ENAC) in Toulouse. The main aim of this two-day conference was to bring together key actors to confront and enrich viewpoints in order to achieve an integrated vision, bringing out areas for improvement and identifying actions required to help this "young" aeronautics sector to develop in a harmonious way.

This conference proved to be of great interest, with high attendance from an enthusiastic audience of varying backgrounds, including manufacturers, operators, end users, research organisations, public bodies and students, as well as representatives of the European (EASA) and American

1. Proceedings of the conference on "Present and Future of Civilian RPAS" – www.academie-air-espace.com/upload/doc/ressources//rpas2014/proceedings.php

(FAA) civil aviation authorities. On behalf of AAE and 3AF, we would like to express our gratitude to the companies and organisations that supported the organisation of this conference: AG-Insurance, Airbus Defence & Space, Apave, Apsys, Bouygues Energies et Services, Dassault Systèmes, DGAC, ENAC, Excelium, FPDC, GRTgaz, La Réunion Aérienne, City of Toulouse, ONERA, Safran/Sagem, SNCF and Thales.

This meeting, gathering together the various stakeholders, provided a unique opportunity to identify key issues and avenues for progress in the development of these new systems in a way that will ensure a high level of safety to people and goods.

Common practice on the part of these two associations is to draw the benefits of such a rich, high quality conference and the many exchanges of information it encouraged by publishing a recommendations dossier.

This dossier not only takes into account the main lessons learned from the conference, but looks further, drawing on documents published in the meantime by the FAA and the European Commission according to three pillars: Regulation – Research – Society. Other presentations made at the International Civil Aviation Organization (ICAO) symposium from 23 to 25 March 2015² have also been taken into account. The subject of RPAS is ongoing, and the months and years to come will certainly bring new information.

The dossier only deals with “light” civilian drones used for professional purposes. Neither military UAVs, nor “recreational RPAS” are discussed. It contains recommendations to encourage the development of this promising branch. We would like to thank the members of the programme committee of the “Present and Future of Civilian RPAS” conference, especially its president Philippe Cazin, for their very hard work in preparing this conference and, under the coordination of Thierry Prunier, for their involvement during the first semester 2015 in order to prepare this document.

Philippe Couillard
President
Air and Space
Academy (AAE)

Michel SCHELLER
President
French Aerospace
Society (3AF)

EXECUTIVE SUMMARY

“A new era for aviation: Opening the aviation market to the civil use of remotely piloted aircraft systems in a safe and sustainable manner.”

“Today Europe is taking a **decisive step towards the future of aviation.**”

These sentences opened the 2014 Communication from the European Commission³ and the declaration of the European community of drones⁴ meeting in Riga in March 2015. To follow up on these declarations of intent, Europe is announcing a 2015 action plan with associated timeline to ensure that all conditions are met for the safe, sustainable emergence of innovative drone services.

According to the Riga declaration, the drones community is committed to working together based on the following principles:

1. Drones need to be treated as new types of aircraft with proportionate rules based on the risk of each operation.
2. EU rules for the safe provision of drone services need to be developed now.
3. Technologies and standards need to be developed for the full integration of drones in the European airspace.
4. Public acceptance is key to the growth of drone services.
5. The operator of a drone is responsible for its use.

This dossier is fully in line with these principles and the following recommendations are intended to support this approach.

There are, and will continue to be, many **differing applications for civilian drones**, both now and in the coming years. Drones are proliferating and already involve a large number of players.

Thanks to their flexibility and ease of implementation, RPAS can offer many different kinds **of services**, either completely new or complementing/substituting for services provided by ground facilities, aircraft, helicopters, satellites and balloons. They can help to **produce more and better**, and in some cases **cheaper**.

These are the services expected by prime contractors, who require access to the final result of the acquisition/processing chain, including automatic diagnosis. The development and economic success of drones will depend on their ability to meet this demand.

Presently, the market is based essentially (80%) on photography and broadcasting, with drone-acquired shots used in most major TV programmes (nature, magazines, sports events ...), but it will evolve in the short term towards **providing data and diagnoses** covering various areas such as:

3. Communication from the European Commission to the Parliament and the Council: [www.ec.europa.eu/transport/modes/air/doc/com\(2014\)207_en.pdf](http://www.ec.europa.eu/transport/modes/air/doc/com(2014)207_en.pdf)

4. Under the Latvian Presidency of the Council of the European Union, meeting of European Commission representatives, civil aviation directors of the EU Member States, data protection authorities and leaders of manufacturing industry and service providers:

www.ec.europa.eu/transport/modes/air/news/doc/2015-03-06-drones/2015-03-06-riga-declaration-drones.pdf

5. www.legifrance.gouv.fr/jopdf/common/jo_pdf.jsp?numJO=0&dateJO=20120510&numTexte=9&pageDebut=08655&pageFin=08657

www.legifrance.gouv.fr/jopdf/common/jo_pdf.jsp?numJO=0&dateJO=20120510&numTexte=8&pageDebut=08643&pageFin=08655

- monitoring large networks (railways, oil and gas pipelines, power lines ...);
- agriculture and the environment;
- diagnoses of the condition of buildings and civil engineering structures;
- mapping and monitoring construction sites, quarries and mines.

It is worth noting that almost all of these applications involve missions at very low altitude, i.e. less than 150 meters above ground level.

In France, since the publication of DGAC regulations in April 2012⁶, **civilian drone market players** – prime contractors, aircraft manufacturers, RPAS manufacturers, operators, remote pilots, etc. – have been able to test a large number of applications. SMEs and large groups have thus been able to study and validate the use of drones in various areas, with experiments often leading to turnkey drone solutions (hardware/software/procedures). The French market has been growing very rapidly and in 2014 represented about 1,200 companies (often small or very small businesses), with a global turnover of between €10 M and €20 M (except recreational drones). This amount is still well below some 2012 market survey estimates due to structural reasons, inadequate investment capacity, or bad targeting.

The 2020 potential market could reach €180 M for France, €1,100 M for Europe and €10 billion worldwide, essentially for the monitoring of infrastructures and networks (35%), civil engineering (15%) and for the mines and oil industries (15%). To reach such a market, adequate regulations and operational rules should be set up.

Today, the major obstacle to development of the drone market lies in its extreme fragmentation into a large number of niches that have to meet multiple needs, requiring a wide variety of skills. These factors result in micro-contracts with narrow profit margins. Competition is high and profits are therefore low.

The market is also highly dependent on local, regional and national aspects, which run contrary to the requirements of competitiveness, safety and quality.

Consequently, some people are imagining an industrial organisation based around regional or franchised “agencies”, or a three-player model whereby an industrial contractor acts as an intermediary between major industries and local and regional service providers.

The strong need for investment in drone systems, together with the technological sophistication required to comply with regulations, places a heavy financial burden on these relatively small players, further reducing profit margins. The main contractors are reluctant to sign multi-year contracts and investors are cautious, limiting their level of shareholding because of the low profit margins already mentioned. So this very young, fragile sector, exposed to international competition, lacks the necessary funding to achieve a solid

industrial footing.

In order to promote growth in this sector, the French drone community has set up a “Conseil pour les drones civils” (national civilian drone council) as one of the plans contained in the report on “La Nouvelle France Industrielle” (New Industrial France, NFI⁶). This council, which comes under the authority of two French ministries, is chaired by the French Director for civil aviation. This initiative should be taken up in other countries to encourage European governments to significantly reinforce their support of research projects and start-ups and thus promote the development of new technologies and exports which are indispensable to the development of RPAS industry.

Drones can cause **damage to third parties, persons and goods** (crash landings, air collisions, departures from planned working airspace). Failures may occur not only in the drone itself, but also in its remote control station and communication/navigation/surveillance systems as well as its air traffic management.

To minimise these risks, various operational measures and technical means can be implemented:

- check all components of the system before use;
- require certification or qualification of certain system components (especially control station and software);
- use protected data links;
- ensure automatic transmission of identification and localisation information;
- organise airspace, informing all participants and providing flight separation services in some airspaces;
- equip drones and/or ground infrastructures (including remote control stations) with simple, cheap “detect and avoid” (D&A) systems;
- train and qualify remote pilots and operators;
- organise and broadcast the lessons learnt from feedback.

Significant **R&D efforts are essential** in order to qualify these procedures and resources. The Horizon 2020 programme⁷, single EU Research and Innovation Programme (which includes SESAR⁸), should significantly increase the share of its budget devoted to drones. It should also urgently address the issue of drones flying at very low level, i.e. those carrying out most professional civilian missions.

For professional drone operations to be safe, their remote pilots must have received appropriate **training, both theoretical and practical**. The syllabus should train them to fly a similar drone system to the one they will be using, in their specific field of activity, with the drone equipped with its real payload.

Should it be mandatory for all remote pilots to hold a **license**? Undoubtedly, in the case of risky operations; for very low-risk operations a training certificate might be enough.

Whatever the case, training is required and should take place in an **approved training school** with attested tea-

6. www.economie.gouv.fr/nouvelle-france-industriellewww.sesarju.eu

7. www.ec.europa.eu/programmes/horizon2020

8. www.sesarju.eu

ching proficiency, to ensure that candidates have the requisite level of knowledge and skills.

In terms of **societal issues**, illegal intrusions and actions have already occurred, both in Europe and the United States. States must ensure that operators and remote drone pilots respect privacy and individual liberties and that they do not commit illegal actions, in particular flying over sensitive and/or protected sites.

Drone operators must therefore be insured and must declare their flight intentions before each mission, equip their vehicles with identification and localisation means and declare their list of their drones and flight paths after every mission.

At the same time, an organisation with the appropriate staff and resources should be set up to process this information and check, sanction, prevent, intercept and identify those responsible and seize their drones, with clear procedures as to decisions on the correct action to be taken.

In the field of **regulations**⁹, France showed the example with its decrees of 2012. These authorise commercial flights according to four scenarios. Since then more than 1,200 operators have emerged and all are looking forward to the expansion of overflight conditions and operating airspaces.

Work is being carried out internationally to **harmonise and standardise conditions** (at least on a European level) for drone integration into airspaces frequented by other aircraft. DGAC and EASA approaches to regulations are consistent, taking the view that it is unacceptable for drone use to give rise to any uncontrolled risk.

In this respect, EASA issued a document¹⁰ proposing three categories:

- an **Open** category, with low risks and no need for airworthiness approval, for flights below 150 m within sight of remote pilots;
- a **Specific** operation category, for operations with some risk, which will necessitate prior safety analysis;
- a **Certified** category, requiring traditional type rating for long-range flights with large, complex drones.

EASA must now prepare a draft regulatory framework and a practical regulatory proposal for the open category, for submission to the European Commission in December 2015.

In February 2015, FAA published a proposal to amend the regulation¹¹ concerning small drones weighing less than 25 kg. These proposals are more restrictive than those proposed by the DGAC – flying beyond visual line of sight is not allowed for instance – and remote pilots must obtain a UAV remote pilot certificate, renewable every two years by training centres approved by FAA.

Drones are not routinely subject to **feedback from experience** reports, despite the fact that these exist in French legislation. Indeed, only a few dozen incidents have been recorded in the feedback from experience initiative set up by DGAC a year or two ago, the problem being that such reports can reveal confidential information on the operator and on the manufacturer's product.

This situation needs to be improved, with a feedback from experience system that relies on several channels rather than just one. These channels must be easily accessible and offer direct, intuitive input.

To be accepted by operators and manufacturers, such processes must be user friendly and functional and it should be made clear that no information will be used against these players. Anonymity should not be considered an obstacle. In time, the process should cover technical failures as well as human errors and be designed accordingly.

A feedback from experience website equivalent to those found in aerospace and sports federations should be set up.



9. For drones weighing under 150 kg

10. Concept of Operations for Drones: A risk based approach to regulation of unmanned aircraft: www.easa.europa.eu/system/files/dfu/EASA%20Concept%20of%20Operations%2012-03-2015.pdf

11. Small UAS Notice of Proposed Rulemaking (less than 55 lbs): www.faa.gov/regulations_policies/rulemaking/media/021515_suas_summary.pdf

THE 3RD SUCCESSFUL SAMP/T LIVE FIRING AGAINST TACTICAL BALLISTIC MISSILE IN 2013 IN COORDINATION WITH NATO IS INTERNATIONALLY RECOGNIZED

Contributors: Colonel (Armement) **Johana Pelletier**, Ballistic Missile Defense capacity manager, DGA ;
 – **Véronique Cham-Meilhac**, Director Business Development Extended Air Defense / Anti-Ballistic Missile Defense (MBDA) ;
 – **Luc Dini**, Director of Business Development Missile Defense (Thales), Co chairman of the international Missile Defense conference 3AF.

Presentation of the Technology Pioneer Award during the International AIAA Conference

In the setting of the annual multinational Ballistic Missile defense conference by the AIAA (American Institute of Aeronautics and Astronautics) the American Missile Defense Agency, on proposal of the international program committee, awarded on 6th October 2015 the 'Technology Pioneer Award' (Figure 1) to the French and Italian SAMP/T extended air defense teams. This prize was created in 2008 in order to honour the singular achievement of an individual or a group in advancing missile defense, with a particular emphasis on expanding international cooperation and consensus.

This 'Technology Pioneer Award' has rewarded the success of the SAMP/T system carried out 6th March 2013 with the ARABEL fire-control radar and the Aster 30 B1 missile which made direct impact on a target representing a SCUD tactical ballistic missile, interconnecting with the NATO chain of command (Figures 2, 3, 4, 5, 6 & 7).

The Ceremony

Major General Francis Autran, Deputy Strategy Director of the French Direction Générale de l'Armement (DGA), gave a speech to an audience of 300 people from 13 countries, amongst which were American, Spanish and Romanian high authorities. He received the award from Vice-Admiral Syring, director of the Missile Defence Agency (MDA). He was accompanied for the occasion by Colonel (Armement) Johana Pelletier, Ballistic Missile Defense capacity manager



Figure 3 : The firing of the Aster B1 missile from the SAMP/T module launcher at DGA Test Centre of Biscarosse (France).

ger within the Direction Générale de l'Armement along with two representatives of the industrial companies MBDA (Ms Véronique Cham-Meilhac) and Thales (Mr Luc Dini), companies who contribute to the SAMP/T system through EUROSAM consortium, and to Integrated Air & Missile Defense in general (Inserts/Figures 11, 12 & 13). All three are members of the AIAA BMD conference international committee and of the 3AF Missile Defense Conference international committee.

Why a live firing against a tactical ballistic missile?

This live firing had the objective to validate the ballistic missile defense operational capacity of the SAMP/T against a SCUD type target and its interoperability with NATO through the use of the Link 16 which enables the SAMP/T to integrate into joint operations.

This event demonstrated the capacity of interception with the ARABEL fire control radar and the Aster 30 Block 1 missile, by direct impact with a SCUD type ballistic target. The launch was carried out at the DGA missiles testing center in Biscarosse (Figure 9), collectively by the fourth artillery regiment of Mantoue (Italy) and the Center of Air Military Expertise (CEAM) in Mont-de-Marsan (Figure 10). It



Figure 1: Technology Pioneer Award



Figure 2 : The ARABEL multi-function fire control radar of the SAMP/T weapon systems.

mobilized the means of various DGA centers and NATO centers as well as an American Aegis destroyer.

What is SAMP/T?

The French-Italian SAMP/T weapon system is by conception totally dual and deals simultaneously with conventional air threats and short range ballistic threats.

The main advantages of the SAMP/T are notably the 360° area defense, its mobility and its air transportability for overseas operations. Developed and produced by Thales (responsible for the fire control system) and MBDA (responsible for the Aster missile and launchers) through the consortium EUROSAM, in cooperation between France and Italy, the SAMP/T system is in service in the 2 countries which bring it as national contributions to NATO ballistic missile defense program.

A SAMP/T section (Figures 7, 8.1 & 8.2) consists of a fire control (an ARABEL multi-function radar and an engagement module) and of 3 to 4 launching modules, each of them armed with 8 Aster missiles (Figures 8.3 & 8.4). The SAMP/T is in operation in the French Air Force and the Italian Army.

Conclusion and perspectives

The next NATO Summit in July 2016 in Warsaw should allow to take stock of the development of the American contribution to the NATO ballistic missile defense (The European Phased Adaptive Approach, EPAA, notably with Aegis destroyers, Aegis ashore equipped with SM3 missiles) and of the development of the NATO command and control system, including ACCS, with dual air and missile defense capability. The European contribution to the collective effort is not outdone, despite a difficult situation which could have rendered missile defense inaccessible to the European technologies, in the face of defense budgets and priorities in Europe. However, the national European contribution, notably the French and Italian ones through SAMP/T, find their place in an integrated air and missile defense capability.

The 'Technology Pioneer Award' is therefore an encouraging sign for transatlantic cooperation which underlines that the European effort is real, by way of the important investments already made, and which recognizes the effective and operational contributions of the SAMP/T during NATO exercises. This reward can also prefigure more synergies between American and European systems, in Europe and in crisis areas – which are also regions of partnership, cooperation and exportation. The interception of cruise or ballistic missiles by direct impact is an accomplished reality by each partner, both American and European, with their special features. It's a matter of defending aerospace areas against threats which are not illusions but a reality if you observe the weapons recently deployed in the Middle East (cruise missiles, long range rockets or short range ballistic missiles), some of which are already available to non-governmental groups. The SAMP/T equipped with the Aster 30 Block 1 missile responds to this protection need and will continue to evolve.

At the end of 2015, a new contract was signed to develop the evolution of the SAMP/T Block 1 NT (new technology), concerning both the Aster 30 B1 NT missile fitted with a new Ka seeker and the fire control system. This confirms the will to improve the readiness and the effectiveness of Integrated Air and Missile Defense European systems to cope with new challenges and threat



Figure 4: A photo of the group during the presentation of the award, from right to left: Mr Norm Tew, VP& Program Director, Strategic Missile & Defense Systems, Boeing (USA) sponsor of the AIAA BMD Year 2015 conference - Ms Nancy Morgan, Director for International Affairs, Missile Defense Agency (USA) – Major General (Infantry) Francis Autran, Deputy Strategy Director, Direction Générale de l'Armement (France) – Mme Véronique Cham Meilhac, Director Business Development Extended Air Defense /Anti-Ballistic Missile Defense, MBDA (France) - Vice Admiral Syring, Director, Missile Defense Agency (USA) – Colonel (Armament) Johana Pelletier, Ballistic Missile Defense capacity manager, Direction Générale de l'Armement (France) - Mr Luc Dini, Director Business Development Missile Defense, Thales (France), co-chairman Missile Defense conference (3AF)



Figure 5: The architecture of the missile defense during the live firing, from bottom to top. The Franco-Italian crew operated 2 SAMP/T sections and intercepted a ballistic target, representative of a SCUD type short range missile. The designation of the SAMP/T was done by a local radar situated in Biscarrosse via a L16 datalink. The chain of command consisted of a French C2 center at Bruz which assured the interface with the command center in Ramstein, regrouping the NATO BMDOC with the ACCS system and the US C2BMC command center, linked with an American Aegis destroyer.

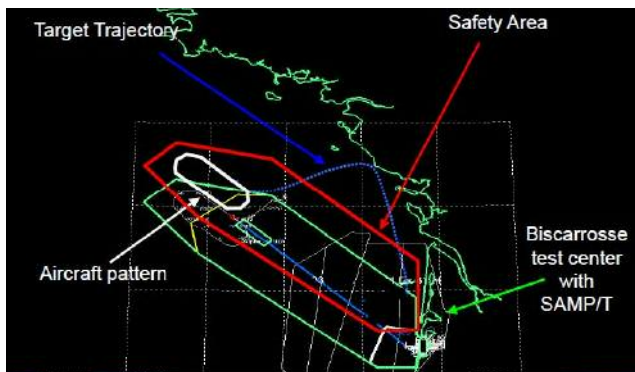


Figure 6: View of the perimeter of the test range during the live trial and the ballistic trajectory in the safety land, naval and aerial zones.



Figure 8.1: The ARABEL fire control radar module « The Eye», with the link of the command missile.

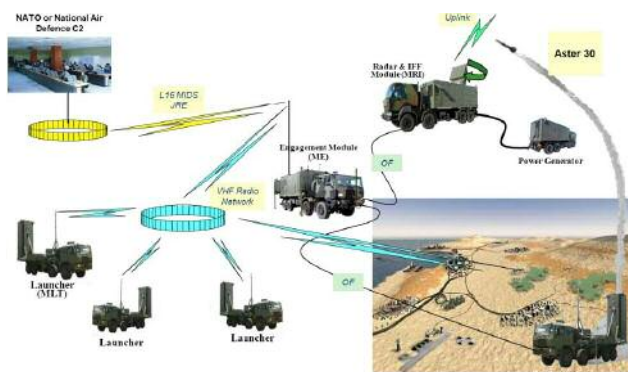


Figure 7: Architecture of the SAMP/T system



Figure 8.2: The Engagement Module of the fire control system, « The Brain ».



Figures 8.3 and 8.4: The Launching Modules armed with 8 hyper-velocity Aster missiles, « The sword ».

DGA EXPERTISE & TEST FACILITIES

DGA MISSILES TESTING (DGA/EM)

- Leader in Europe
 - For ground and flight tests of missile
 - Mastering all phases of the life cycle
- Main missions
 - Be involved in the development of missile-based weapon systems
 - Provide evidence of performance in real conditions
 - Train and qualify operational forces
- Safety of personnel and assets
- Main yearly figures
 - Missiles fired: ~ 400
 - Targets fired: ~ 250
- Cutting-edge technology facilities
 - Test & Evaluation capabilities
 - Measurement Acquisition Systems
 - Observation Systems
 - IT and Telecommunications
 - Teleneutralisation

Figure 9: DGA Missiles testing

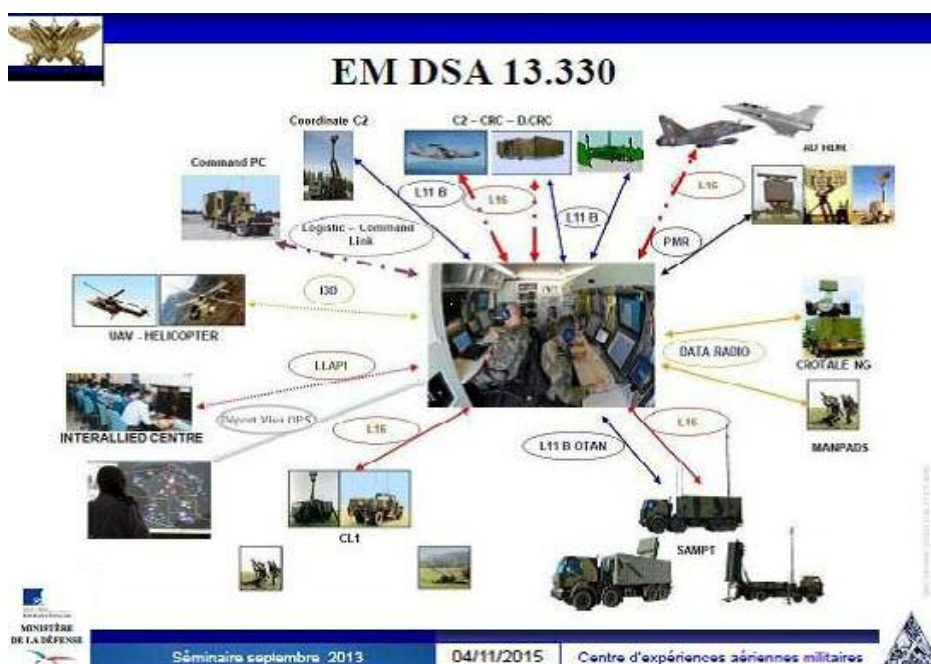


Figure 10: personnel at CEAM Air Defense System Mark Team 13.330 were involved in the ATOC ATBM live firing for the operational implementation of the French SAMP/T. Their recognized expertise allows them to interface their coordination systems and ground air defense with different systems of the centre of air defense expertise (CEAM), for the experimentation phases, but equally with air force systems and our allies for operational missions and exercises.



Insert/Figure 11

EUROSAM was created in June 1989 by 3 large groups of the European Aerospace industry (Aérospatiale, Alenia & Thomson-CSF) known today as MBDA missiles and Thales respectively.

EUROSAM is the primary contractor and system design authority on development, production and marketing-sales of long and medium range ground and naval systems, also known as the 'Future Surface-to-Air Family' (FSAF).

These systems were developed under French & Italian government contracts, which succeeded at the end of the eighties with similar conclusions for the specification of their operational air defense systems. This would require ground & naval systems capable of dealing with diverse threats such as high speed tactical missiles (supersonic sea skimmer missiles, warplane missiles, ARM, cruise missiles, tactical ballistic missiles and other types) as well as highly maneuverable aircraft in the configurations of overwhelming attacks. The key capacity of these systems is the ability to engage multiple targets simultaneously regardless of their combination in 360°.

The naval systems (Surface-to-air Anti-missile Systems SAAM and SAAM AD/PAAMS) for protecting naval units use Aster 15 and Aster 30 missiles guided by Arabel or EMPAR radars.

The medium range surface-to-air system (SAMP/T) uses Aster 30 missiles guided by the Arabel radar and, for French and Italian teams, acts as a replacement for the Hawk air defense system. The French air force has also recovered its long range engage-

ment capacity which had been lost with the end of the Nike system.



Insert/Figure 12

MBDA, European leader in weapons systems, boasting a vast experience in the development and production of programs directed through multinational cooperation, has for many years set about working on the development and concepts of weapons systems in the domain of extended air defense, notably for the systems using Aster missiles.

Besides its contribution to NATO ballistic missile defense aiming to establish a database on future threats, MBDA has participated in BMD NATO studies, and in France has been known for demonstrating its expertise on the characterization of the TBM maneuverable threat, by gaining numerous studies. Equally, MBDA has developed a large know-how in technical simulations of defense systems using Aster missiles in the evaluation of performance.

For Aster missiles systems as a whole, MBDA is the prime contractor of the missile, the launchers and, sometimes, the naval firing installations.

By design, the Aster missile is capable of integrating in various defense architectures and ground & naval platforms. Developed in FR / IT cooperation for the ground version and FR / IT / UK cooperation for the naval version, it is the weapon of choice for 60 extended AD systems in the world and is in service in the French Air Force, the Italian Army and the French, Italian and British navies.

A dual missile, today it is capable of dealing with, in the Block 1 ground version, short range ballistic targets by direct hit, still maintaining its exceptional

qualities against conventional Air targets: civil aircraft, tactical missiles & cruise missiles, ...

The expected performances of the Aster Block 1NT, for which contract is now signed, will allow it to target ballistic missiles within 1500 km as well as new anti-ship missiles.

The SAMP/T with the Aster 30 Block 1 represents French & Italian voluntary contributions to NATO BMD.



Insert/Figure 13

THALES is a key actor with a large portfolio of IAMD activities from the NATO C4I Air and the ACCS system through to ThalesRaytheonSystem, a joint venture with Raytheon, as well as the C2 GBADOC mobile coordination systems of air defense.

It's completed by Early Warning systems, space, naval (SMART-L EWC) and ground with UHF long range radars made with ONERA.

Subsequently, Thales contributes to the IAMD weapons systems through the management of the fire control system of the SAMP/T (B1 and B1NT improved versions), namely the X band Arabel radar, which exists in naval version (PA CDG, Sawari2) and

the fire control system of the PAAMS of the Horizon Frigates, via EUROSAM. Finally, Thales provides the multifunction radars MFR Herakles in the S band of FREMM frigates and develops new electronics for the future S band active antennas for the SF500/GF1000 ranges of MFR long range radars. In its role as supplier Thales develops the electronics of the seeker of the Aster missiles, which the future NT Ka seeker is planned for the Aster B1NT.

In parallel, Thales plays a key role in the integration and testing of national & NATO IAMD systems. Among these integration and validation tests, for the last 10 years Thales has taken part in the program of system engineering and integration (SE&I) of NATO ballistic missile defence architecture, but also in national platform tests including tests on firing range and trials. Thales was present in 2006 for the trials of SMART-L in Hawaii, in 2010, 2011 and 2013 for the Franco-Italian ATBM & SAMP/T live firing in Biscarosse and also for the JPOW exercises with NATO in 2013 and in 2015, for the naval trials of the ASD 15 in Scotland (MFR Herakles Radar of FREMM and the SMART-L radar of the Dutch frigate which detected and pursued ballistic targets).

SPEECH OF MAJOR GENERAL FRANCIS AUTRAN DURING THE AWARDS CEREMONY

French-Italian SAMP/T live firing against TBM, interconnected with NATO BMD C2 in Ramstein

“ It is a great honour to receive the technology pioneer award for the French-Italian SAMP/T live firing against theatre ballistic missile interconnected with the NATO command and control chain for BMD operations in Ramstein. Please let me briefly remind what the SAMP/T is and what were the specificities of this live firing.

SAMP/T is the European medium range extended air defence system. It has been developed and produced by Thales and MBDA through EUROSAM, in cooperation between France and Italy. A SAMP/T battery is a highly modular system, designed to be rapidly deployed by a minimum military crew. It relies on three different types of modules:

- an Engagement module manned by only two operators. The engagement module manages the firing units and is interfaced with the command and control chain;
- an Arabel radar and IFF identification module for surveillance, detection, tracking and missile in flight guidance;
- and finally vertical launchers fitted with Aster 30 Block 1 missiles.

All these modules are interconnected through fibre optics or radio-link.

SAMP/T is an extended air defence system: it means that it is an integrated air and missile defence weapon system, able to cope at the same time with air breathing targets

and theatre ballistic missiles. It can simultaneously counter conventional targets, including anti-radiation missiles, aircrafts, supersonic cruise missiles and theatre ballistic missiles. It is a three hundred sixty degrees coverage system, mobile and flexible. SAMP/T has been operated for some years now by the French Air Force and the Italian Army. The system is currently used in France to protect national vital assets and to bring protection to major events such as international summits.

SAMP/T is the first European-made interceptor system available to support NATO's mission to protect deployed forces from the growing threat posed by the proliferation of theatre ballistic missiles; we all know how serious and largely disseminated the short range ballistic threat derived from the SCUDs is.

But the SAMP/T story does not stop here. France and Italy are about to give SAMP/T a new “boost” if I may say. The system will soon be upgraded with the Aster Block 1 NT missile. B1NT developments will bring additional performances against smaller radar cross section, manoeuvring and longer range targets. It will continue on its way to counter conventional and ballistic threats and that includes anti-ship ballistic missiles.

Now the live firing.

After two successful SAMP/T live firings against ballistic targets, France and Italy conducted in March 2013 a third SAMP/T live firing with NATO and the United States. The objectives of this event were not only to demonstrate SAMP/T missile defence capability in joint operations but

also to demonstrate that SAMP/T is a Link 16 interoperable system and is capable of using an external cueing provided by a remote chain of command.

In order to get ready for the live firing, successful tests were conducted beforehand with the NATO BMD Integration Test Bed. The firing was thoroughly prepared during more than a year and involved 200 people. 450 persons attended the event on March 6th, 2013.

On that day, a joint French Air Force and Italian Army crew operated 2 SAMP/T firing sections and intercepted a target representative of a SCUD short range ballistic missile. The great involvement and professionalism of all parties managed to cope with the high complexity of the live firing network that included an operational satellite link for data transmission, the NATO BMD command and control centre in Ramstein, an Aegis destroyer and the US C2BMC.

This live firing took place in DGA Missiles Testing facility in Biscarrosse, south west of France, a place that provides large safety areas and is equipped with important testing and supporting resources. This is actually the place where France performs all the French strategic ballistic missile firings. This place, unique in Europe for ground and flight tests of missiles, benefits from cutting-edge technology facilities including launching pads, benches, targets, measurement acquisition and observation systems and also a special test and measurement ship called Le Monge.

Finally, the Aster 30 missile successfully engaged and destroyed the short range ballistic target for the third consecutive time! SAMP/T also proved its ability to work with NATO's Ballistic Missile Defence command and control system and the US system deployed in Europe. "

17 DECEMBER 2015: AN IMPORTANT STEP FORWARD FOR GALILEO



Photo 1: Galileo Soyuz VS13 liftoff. ©ESA/CNES/ARIANESPACE-Optique Vidéo du CSG-S. Martin

The pace of deploying Europe's own satellite navigation system continued to increase with today's launch of the latest pair of Galileo satellites.

Galileo 11 and 12 lifted off together at 11:51 GMT (12:51 CET, 08:51 local time) atop a Soyuz rocket from French Guiana.

This sixth Galileo launch was a textbook operation: all Soyuz stages performed as planned, culminating in the Fregat upper stage deploying the twin satellites into orbit close to 23 500 km altitude, around 3 hours and 48 minutes after liftoff.

"With today's launch, Europe has doubled the number of its Galileo satellites in orbit in just nine months," commented Jan Woerner, Director General of ESA.

Galileos 11 and 12

"Along with the ground stations put in place around the globe, this brings Galileo's completion within reach. Initial Galileo services are scheduled to begin within next year,



photo 2: Galileos 11 and 12 ©ESA/CNES/ARIANESPACE/Optique vidéo du CSG - JM Guillon

which proves the importance of this wise investment."

"The excellent performance of these satellites, as measured on the ground, allows Europe to join the club of the worldwide providers of satellite navigation services," noted Didier Faivre, ESA's Director of Galileo and Navigation-related Activities.

"Production, testing and launch of the remaining satellites are now proceeding on a steady basis according to plan.

Galileo satellites released into orbit



photo 3: Galileo satellites entering free-flight
© ESA-J. Huart, 2014

Then, after the summer break in 2016, the tempo of deployment will increase further with the first of three customised Ariane 5 launchers that will carry four rather than two satellites into orbit each time.

30-satellite Galileo constellation

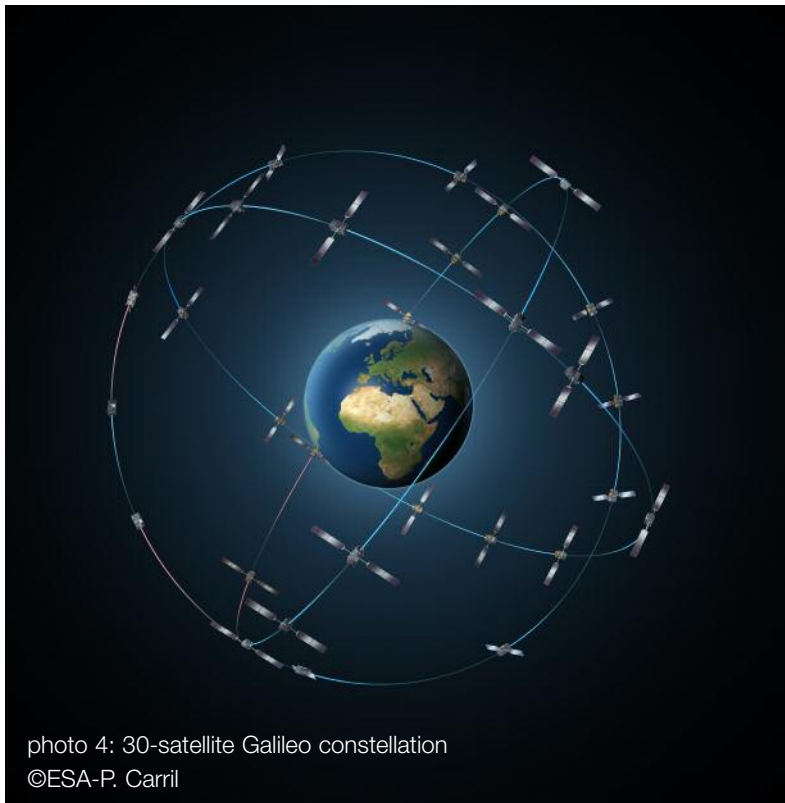


photo 4: 30-satellite Galileo constellation
©ESA-P. Carril

About Galileo

Galileo is the EU's own global satellite navigation system, consisting of 30 satellites and their ground infrastructure. The definition, development and In-Orbit Validation phases were carried out by ESA, and co-funded by ESA and the European Commission. This phase created a miniconstellation of four satellites and a reduced ground segment set-up to validate the overall concept.

The Full Operational Capability phase is fully funded by the European Commission. The Commission and ESA have signed a delegation agreement by which ESA acts as design and procurement agent on behalf of the Commission.



CONSULT THE CPMIS : CEAS CONFERENCE PROGRAMMING MANAGEMENT INFORMATION SYSTEM

The aim of the CPMIS is to facilitate the search of the different aerospace events in the world that are programmed at short and mid-term time horizon, and so allowing to optimise the scheduling of future events by avoiding possible overlapping and redundancies, but on the contrary to encourage co-operations and synergies between the actors concerned.

The address is: <http://www.aerospace-events.eu>

A search engine selects the events according to specific topics and key words. A graphic display (day, week and months view) eases the access and the view.

- 4 TYPES: Conference, Workshop, Lecture, Air Show
- 6 MAIN CATEGORIES: Aeronautical sciences - Aerospace (for events including all aspects of aviation and space) - Civil Aviation - Air power - Space - Students and Young Professionals.

- 64 SUB - CATEGORIES: aeroacoustics - aeroelasticity - aerodynamics, etc.

AUTOMATIC INSERTION OF NEW EVENTS BY THE ORGANISERS THEMSELVES:

- Go to <http://www.aerospace-events.eu>
- Click on the "introduction" text
- Redirected on the New Event Form, you have to click on this form and to enter your event related information, validate, click on Save and send.

Point of Contact:

postmaster@aerospace-events.eu is the general address for any question and requests;

– Jean-Pierre Sanfourche, CEAS, responsible for the Events Calendar permanent updating and validation: sanfourche.jean-pierre@orange.fr

YEAR 2016

04-08 January • **AIAA** – AIAA SciTech 2016 – San Diego, CA (USA) – Manchester Grand Hyatt
<http://www.aiaa-sci-tech.org/>

14-15 January • **EDA** – First Plenary Session – Consultation Forum for Sustainable energy in the Defence & Security Sector – Brussels (Belgium) – www.eda.europa.eu/info-hub/Events

27-29 January • **3AF/SEE/SIA** – ERTS2 2016 (ERTS Embedded Real Time Software Systems) – Toulouse (France) – Centre de Congrès Pierre Baudis - www.erts2016.org

02-04 February • **3AF** – OPTRO 2016 – Paris 16^e (France) – OECD Conference Centre – <http://www.optro2016.com>

14-18 February • **AAS/AIAA** – Space Flight Mechanics Meeting – Napa, CA (USA) – Embassy Suite Napa Valley – <http://www.space-flight.org/>

23-24 February • **RAeS** – 2016 RAeS Air Transport Conference – 4 hours door-to-door within Europe by 2050 – London (UK) – RAeS/HQ – www.aerosociety.com/Events/

01-03 March • **ESA** – European Space Components Conference ESCCON 2016 – Noordwijk (NL) – ESTEC – www.esa.int

05-12 March • **IEEE** – 2016 IEEE Aerospace Conference – Big Sky, MT (USA) – Yellow Stone Conference Center – <http://www.aeroconf.org>

08 March • **RAeS** – Aerospace Medicine Symposium 2016 – London (UK) – RAeS/HQ – www.aerosociety.com/Events/

08-10 March • **CANSO /ATCA** – World ATM Congress 2016 – Madrid (Spain) – IFEMA Feria – www.worldatmcongress.org/2016

14-17 March • **ESA** – 6th International Conference on Astrodynamics Tools and Techniques ICATT – Darmstadt (Germany) – ESA/ESOC – www.esa.int

14-18 March • **ESA** – From Giotto to Rosetta – Noordwijk (NL) – ESREC – www.esa.int

15-17 March • **ESA** – Big Data from Space BIDS – Santa Cruz de Tenerife (Spain) – Auditorio de Tenerife – www.esa.int

15-17 March • **IATA** – 10th World Cargo Symposium – WCS – Berlin (Germany) – Berlin Hotel Continental – www.iata.org/events/

18 March • **RAeS** – Financing the Business of Aerospace – Conference – London (UK) – RAeS/HQ – www.aerosociety.com/Events/

30-31 March • **ICAO** – IATS2016 – Third ICAO Air Transport Symposium (IATS) – Montréal (Canada) – ICAO/HQ – www.icao.int/meetings

04 April • **Clean Sky JU** – Clean Sky Forum – Brussels (Belgium) – Hotel Bd de Waterloo 38 – www.cleansky.eu/content/events

04-06 April • **3AF – AERO2016** – 51st Applied Aerodynamics International Conference – Strasbourg (France) – European Doctoral College, University of Strasbourg – 46, bd de la Victoire – www.3AF-aerodynamics2016.com

04-08 April • **ESA** – Spacecraft Changing Technology Conference – Noordwijk (NL) – ESTEC – www.esa.int

12-14 April • **SAE International** – SAE 2016 World Congress & Exhibition- Powering possibilities – Detroit, Michigan (USA) – Cobo Center – <https://www.sae.org/congress/>

12-14 April • **3AF** – AEGATS'16 : Advanced Aircraft Efficiency in a Global Air Transport System – Paris 12^e (France) – Les Salons de l'Aveyron – <http://www.aegats.com>

12-15 April • **ESA** – Water in the Universe from Clouds to Oceans – Noordwijk (NL) – ESTEC – www.esa.int

14 April • **RAeS** – Flight Tracking – London (UK) – RAeS/HQ – www.aerosociety.com/Events/

19-21 April • **ICNS/IEEE/AIAA** – 16th Integrated Communications and Surveillance Conference – Herndon, VA (USA) – Westin Washington Dulles Airport Hotel – <http://i-cns.org>

20-23 April • **AERO Friedrichshaffen** – The Global Air Show for General Aviation – www.aero-expo.com

1 May • **ERCOFTAC** – Lattice-Boltzmann-Methods (LBM) for Industrial Applications – Paris (France) – www.ercoftac.org/events/

02-06 May • **3AF/ESA/CNES** – Space Propulsion 2016 – Rome (Italy) – Conference Centre, Via Col. T. Massia – <http://www.propulsion2016.com>

09 May • **RAeS** – Conference: Aircrew Mental Health and Well Being 2015 to 2040 – London (UK) – RAeS/HQ – www.aerosociety.com/Events/

09-13 May • **ESA** – Living Planet Symposium – Prague (Czech Republic) – Prague Congress Centre – www.esa.int

15-18 May • **IATA** – 29th IATA Ground Handling Conference – Enhancing Developing and Innovating Grounds for Success – Toronto (Canada) – The Westin Harbour Castle – www.iata.org/events/

16-20 May • **AIAA** – SpaceOps 2016 – Daejeon (Korea) – Daejeon Conference Center – <http://www.spaceops2016.org>

17-19 May • **IATA** – Aviation Fuel Forum – Prague (Czech Republic) – Hilton Prague Hotel – www.iata.org/events/

24-26 May • **EBAA/NBAA** – EBACE 2016 – Geneva (Switzerland) – Palexpo – www.ebase/aero/2016

26 May • **RAeS** – Propulsion Conference 2016 – London – RAeS/HQ – www.aerosociety.com/Events/

30 May-1 June • **AIAA/CEAS/3AF** – Aeroacoustics Conference - Lyon (France) - Lyon Convention Centre - <http://www.acoustic.ec-lyon.fr> – www.aeroacoustics2016.com - Daniel.juve@ec-lyon.fr

30 May-1 June • **State Research Center of the RF** – 23rd St-Petersburg International Conference on Integrated Navigation Systems - Saint Petersburg (Russia) – Concern CSRI Elektropribor JSC www.elektropribor.spb.ru

30 May-03 June • **ESA** – 4S Symposium 2016 – Valletta (Malta) – Grand Hotel Excelsior www.esa.int www.congrexprojects.com/

01-02 June • **AAE** – Conference: Will Air Transport be Fully Automated by 2050? – Toulouse (France) – Centre International de Conférences Météo-France – www.academie-air-espace.com/ATA

01-04 June • **BDLI Messe** – ILA Berlin 2016 – Berlin ExpoCenter Airport – Schönefeld - International Air Show 'The Focal Point of Aerospace' www.ila-berlin.com/ila2016

05-10 June • **ECCOMAS** – 7th European Congress on Computational Methods in Applied Sciences and Engineering – Crete Island (Greece) – Creta Maris' Conference Centre in Hersonissos – www.eccomas2016.org

07-08 June • **RAeS** – Flight Simulation Conference – The future of flight simulation over 10 to 20 years – London (UK) – RAeS/HQ – www.aerosociety.com/Events/

13-17 June • **AIAA** – AIAA Aviation 2016 – Washington, DC (USA) – Washington Hotel – <http://www.aiaa.org/Event/>

14-16 June • **SESAR JU** – SESAR 1 Closure Event – Amsterdam (NL) – Congress Centre – www.sesarju.eu

20-22 June • **ACI Europe** – 26th ACI Europe General Assembly Congress & Exhibition – European Airport Industry: recent and future developments - Athens Airport (Greece) – Divini Apollon Palace & Thalasso www.aci-europe-events.com/

05-08 July • **AIAA** – ICNPAA 2016 Mathematical Problems in Engineering, Aerospace and Sciences – La Rochelle (France) – University La Rochelle – www.icnpaa.com

11-17 July • **Farnborough International Ltd** – Farnborough International Airshow Trade 2016 – Farnborough (UK) – Showcentre – ETPS Rd – www.farnborough.com

19-21 July • **RAeS** – Applied Aerodynamics Conference 2016 – Bristol – Science Centre <http://www.aerosociety.com/AA2016>

25-27 July • **AIAA/SAE/ASEE** – AIAA Propulsion and Energy 2016 – Salt Lake City, UT – Salt palace Convention Center – <http://www.aiaa-propulsionenergy.org>

30 July-07 August • **COSPAR** – COSPAR 2016 – Istanbul (Turkey) – Congress Center (Taksim District) – Invited by Scientific and Technological Research Council of Turkey – <http://www.cospar-assembly.org>

05-08 September • **ERF** – ERF2016 – 42nd European Rotorcraft Forum – Lille (France) – Grand Palais – www.erf2016.com

12-16 September • **EUROMECH** – 11th European Fluid Mechanics Conference (EFMC 11) – Sevilla (Spain) – Universidad – www.efmc.org

13-16 September • **AIAA/AAS** – AIAA SPACE 2016 – AIAA Space Conference – AIAA/AAS Astrodynamics Specialist Conference – AIAA Complex Aerospace Systems Exchange – Space and Astronautics Forum and Exposition – Long Beach, CA – Long Beach Convention Center – www.aiaa-space.org/

25-30 September • **ICAS** – ICAS2016 – Daejeon (Republic of Korea) – Convention Center Daejeon – 30th Congress of ICAS – <http://www.icas2016.com>

27 September-07 October • **ICAO** – 39th ICAO Assembly Session – Montréal (Canada) – ICAO/HQ – www.icao.int/meetings

04-06 October • **RAeS** – 5th Aircraft Structural Design Conference – Lisbon (Portugal) – IST
<http://www.aerosociety.com/5ASD>

26-30 September • **IAF** – IAC2016 – 67th edition of IAC. Organised by IAF, hosted by Mexican Space Agency (MSA) - Motto = “Making space accessible and affordable to all countries”. – Guadalajara (Mexico) – www.iafastro.org

05-07 October • **3AF** – IES2016 – 13th Forum on Economical and Strategic Intelligence – Rouen (France) – www.ies2016.com

11-13 October • **3AF** – GA2016 – 2nd Greener Aviation Conference – Brussels (Belgium) – Square Meeting Center – www.greener-aviation2016.com

18-20 October • **Aviation Week** – MRO Europe 2016 – Amsterdam (NL) – RAI Exhibition and Conference Centre – www.mroeuropa.aviationweek.com/

18-20 October • **IATA** – 6th World Passenger Symposium – Dubai (UAE) - JW Marriott Marquis Dubai – www.iata.org/events/

18-21 October • **EASN** – 6th EASN International Conference – Porto (Portugal) – www.esan.net

14-16 November • **FSF** – 69th annual International Air Safety Summit (IASS) – IASS = the largest safety event. Dubai (UAE) – Congress Centre & Hub – www.flightsafety.org/



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